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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/181,809	10/29/1998	TSUTOMU ISHII	101327	1313

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2653	20

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/181,809	Applicant(s) ISHII ET AL.	
	Examiner Kim-Kwok CHU	Art Unit 2653	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *Amendment filed on April 22, 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-55* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-55* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☒ Interview Summary (PTO-413) Paper No(s). *20* .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Response to Remark

1. The Remarks filed on April 22, 2002 has been considered

(a) on page 19 of the Remarks, lines 19-23, Applicant states that "neither Leube, Tsujioka or Chen, either alone or in combination, disclose or suggest an optical medium, wherein at least recorded information can be reproduced from the optical medium so that a polarization angle of a reproducing light is at least twice that of a recording light". Accordingly, although neither Leube, Tsujioka or Chen discloses above feature, it is an inherent characteristic obtained as the result of a liquid crystal recording layer acting as a half-wave plate. In other words, as long as the recording layer is a liquid crystal polymer, it will behave as a light polarizer, and the reflected (reproducing) light inherently has a certain angle difference with the incident (recording) light.

When the liquid crystal recording layer acts as a half-wave plate, it will rotate the polarization angle of the incident light by 180 degrees and formed a mirror image of the incident light. The mirror image now is the reflected (reproduced) light and its polarization angle is twice the polarization angle of the incident light.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

> *A person shall be entitled to a patent unless --*
> *(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.*

3. Claims 30-34 are rejected under 35 U.S.C. § 102(b) as being anticipated by Lindow et al. (U.S. Patent 4,847,823).

Lindow teaches an optical recording apparatus having all of the elements and means as recited in claims 30-34. For example, Lindow teaches the following:

(a) as in claim 30, a light source 12 that generates recording light (Fig. 1);

(b) as in claim 30, a spatial optical modular 14 that controllably rotates a polarization angle of the recording light (Fig. 1);

(c) as in claim 30, a focusing optical system 30 that directs the recording light obtained through the spatial optical modulator to an optical recording medium 34 (Fig. 1);

(d) as in claim 31, the spatial optical modulator 14 controls a polarization angle of the recording light in response to recording information (Fig. 1; column 3, lines 11-

13);

(e) as in claim 32, the spatial optical modulator is a polarization rotary device (Fig. 1; lines 11-13);

(f) as in claim 33, a medium driving mechanism that rotates the optical recording medium 34 (Fig. 1; medium driving mechanism is an inherent feature because the recording medium needs to be rotated);

(g) as in claim 33, a head moving mechanism that moves an optical head that includes the light source, the spatial optical modulator and the focusing optical system 30 (Fig. 1; inherent feature of Lindow's optical head which houses above claimed light source, modulator and focusing element); and

(h) as in claim 34, an optical recording medium 34.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. **§** 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> *(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.*

5. Claims 1-10, are rejected under 35 U.S.C. 103(a) as being unpatentable over Leube et al. (U.S. Patent 5,251,197) in view of Lindow et al. (U.S. Patent 4,847,823) and Michl et al. (U.S. Patent 4,864,537).

Leube teaches an optical recording medium very similar to the instant invention. For example, Leube teaches the following:

(a) as in claim 1, the optical recording medium comprises at least one optical recording layer 12 (Fig. 1);

(b) as in claim 1, the optical recording layer 12 including an optical recording material having at least one of a polymer or a liquid crystal polymer that changes a state of photo induced birefringence in response to a recording light 14 (Fig. 1);

(c) as in claim 1, a substrate which sustains the optical recording layer, wherein recorded information can be reproduced from the optical recording medium (Fig. 1; substrate is an inherent feature of an optical recording medium);

(d) as in claim 2, the recording layer 2 has a refractive index expresses in variables of wavelength and thickness as $\Delta n * d = (m + 1/2) * \lambda$ (inherent feature of a half-wave plate as illustrated in equations 2 and 5 on pages 6 and 9 respectively);

(e) as in claim 3, the photo-induced birefringence is

caused by a refractive index change (inherent feature of the anisotropic material which induces birefringence);

(f) as in claims 4, 5, 7 and 8, the recording layer 12 comprises a liquid crystal polymer (azobenzene) comprises a side chain that includes a group which is photoisomerized (Fig. 1; column 2, line 51; azobenzene is a photoisomerized material);

(g) as in claims 6 and 9, the polymer comprises at least one kind of monomer-polymer azobenzene (inherent feature because monomer azobenzene is a required material for forming photoisomerization) and

(h) as in claims 10, the optical layer 2 has a disk shape recording medium (Fig. 1).

However, Leube does not teach the following:

(a) as in claim 1, the recording light is externally controlled from the optical recording medium to rotate a polarization angle of the recording light;

(b) as in claim 1, a portion of the recording layer that changes a state of photo-induced birefringence substantially acting optically as a half-wave plate (phase difference between o and e is 180 degree); and

(c) as in claim 1, the polarization angle of a reproducing light is at least twice that of the recording light.

Lindow teaches an optical imaging system where the polarization of a light beam generated from a laser source is externally rotated by a polarizer 14 (Fig. 1).

Michl teaches a polymer recording layer which acts as a half wave plate (column 13, lines 12-15).

A light beam generated from a laser source is not necessary traveling in a predetermined polarized mode. In other words, it is not linear/circular polarized. In order to restrict the light beam's polarization angle after it interacts with other optical devices, the light beam should be set to have a known polarized mode first. For example, Lindow's light beam is linear polarized by a polarizer device.

Therefore, for the advantage of detecting the polarization angle of a reflected (reproducing) light beam such as Leube's, it would have been obvious to one of ordinary skill in the art at the time of invention to set a predetermined polarized writing beam 14 first with an external polarizer similar to Lindow's, because the known polarized writing beam 14 will react with the recording surface and then the polarization angle difference of the reflected light beam can be detected.

With respect to the recording layer which reflects Leube's polarized light beam, a polymer such as a liquid crystal is used as a light polarizer. Although Leube does not specify the phase angle as a result of the induced birefringence of his

polymer polarizer, Michl teaches that the birefringence of a polymer can be induced as desired (column 14, lines 41-48). In this case, Michl teaches that the induced birefringence of his polymer acts as a half wave plate.

Hence, where there is an advantage of rotating a reflected light beam, for example, 180 degree mirror image of the of the incident light, in order to detect the data stored in the recording layer, it would have been obvious to one of ordinary skill in the art at the time of invention to heat certain areas of Leube's polymer recording layer until the areas act as a half wave plate similar to Michl's heated polymer layer so that the areas can be read based the polarization angle of the reflected light beam.

Furthermore, above item (c) is an inherent feature. Since the liquid crystal recording layer acts as a half-wave plate, it will rotate the polarization angle of the incident light by 180 degrees and formed a mirror image of the incident light. The mirror image now is the reflected (reproduced) light and its polarization angle is twice the polarization angle of the incident light.

6. Claims 11-20 has limitations similar to those treated in the above rejection(s), and are met by the references as discussed above. Claim 11 however also recites the following limitations:

(a) an optical reflection layer formed on one surface of the optical recording layer.

Although all the references do not disclose an optical reflection layer, it is not novel. The reflection layer is an inherent feature of an optical recording medium such as Leube's, because it is needed to reflect the light beam back as a reproducing light beam for data detection.

7. Claims 21 has limitations similar to those treated in the above rejection(s), and are met by the references as discussed above.

8. Method claims 22-25 are drawn to the method of using the corresponding apparatus claimed in claim 1. Therefore method claim 22 corresponds to apparatus claim 1 and are rejected for the same reasons of anticipation (obviousness) as used above.

In addition, Leube also teaches the following limitations:

(a) as in claim 24, rotating the optical recording medium (Fig. 1; inherent feature because the recording medium needed to be rotate in order to access the recorded information); and

(b) as in claim 24, radiating the recording light along a diameter direction of the optical recording medium (Fig. 1; inherent feature because the recording light needed to be radiated along the diameter direction of the medium in order to record information); and

(c) as in claim 25, the optical element is formed in a position at least partially coextensive with an existing optical element in the optical recording medium (Fig. 1; half-wave plate is formed on the recording layer under the light beam).

9. Claims 26-29 has limitations similar to those treated in the above rejection(s), and are met by the references as discussed above. Claim 26 however also recites the following limitations:

(a) the optical recording medium acts as a quarter-wave plate.

Michl teaches that the media having the property of birefringence can be either acts as a quarter-wave or a half-wave plate (Fig. 7; column 13, lines 37-41; column 14, lines 49-54). Therefore, as an alternative choice of design, it would have been obvious to one of ordinary skill in the art at the time of invention to change the birefringence of Leube's recording layer as a quarter-wave plate.

10. Claims 35 and 36 has limitations similar to those treated in the above rejection(s), and are met by the references as discussed above. In addition, Leube also teaches the following limitations:

(a) as in claim 35, the recording material stores multilevel (zero and 1) information (inherent feature).

11. Claims 37 and 38 has limitations similar to those treated in the above rejection(s), and are met by the references as discussed above. In addition, Leube also teaches the following limitations:

(a) as in claim 37, the recording material stores multilevel (zero and 1) information (inherent feature).

However, Claim 37 also recites the following limitations:

(a) the optical recording medium acts as a quarter-wave plate.

Michl teaches that the media having the property of birefringence can be either acts as a quarter-wave or a half-wave plate (Fig. 7; column 13, lines 37-41; column 14, lines 49-54). Therefore, as an alternative choice of design, it would have been obvious to one of ordinary skill in the art at the time of invention to change the birefringence of Leube's recording layer as a quarter-wave plate.

12. Claim 39 has limitations similar to those treated in the above rejection(s), and are met by the references as discussed above. In addition, Leube also teaches the following limitations:

(a) as in claim 39, the recording material stores multilevel (zero and 1) information (inherent feature).

13. Method claims 40-42 are drawn to the method of using the corresponding apparatus claimed in claim 1. Therefore method claim 40 corresponds to apparatus claim 1 and are rejected for the same reasons of anticipation (obviousness) as used above.

In addition, Leube also teaches the following limitations:

(a) as in claim 41, the reproducing light has a light intensity smaller than that of the recording light (Fig. 1; inherent feature because the intensity of the reproducing light does not need to change the recording layer);

(b) as in claim 42, rotating the optical recording medium (Fig. 1; inherent feature because the recording medium needed to be rotate in order to access the recorded information); and

(c) as in claim 42, radiating the reproducing light along a diameter direction of the optical recording medium (Fig. 1; inherent feature because the reproducing light needed to be radiated along the diameter direction of the medium in order to access the recorded information).

14. Method claims 43-45 are drawn to the method of using the corresponding apparatus claimed in claim 1. Therefore method claim 43 corresponds to apparatus claim 1 and are rejected for the same reasons of anticipation (obviousness) as used above. In addition, Leube also teaches the following limitations:

(a) as in claim 43, the recording material stores multilevel (zero and 1) information (inherent feature);

(b) as in claim 44, the reproducing light has a light intensity smaller than that of the recording light (Fig. 1; inherent feature because the intensity of the reproducing light does not need to change the recording layer);

(c) as in claim 45, rotating the optical recording medium (Fig. 1; inherent feature because the recording medium needed to be rotate in order to access the recorded information); and

(d) as in claim 45, radiating the reproducing light along a diameter direction of the optical recording medium (Fig. 1; inherent feature because the reproducing light needed to be radiated along the diameter direction of the medium in order to access the recorded information).

Claim 43 however also recites the following limitations:

(a) the optical recording medium acts as a quarter-wave plate.

Michl teaches that the media having the property of birefringence can be either acts as a quarter-wave or a half-

wave plate (Fig. 7; column 13, lines 37-41; column 14, lines 49-54). Therefore, as an alternative choice of design, it would have been obvious to one of ordinary skill in the art at the time of invention to change the birefringence of Leube's recording layer as a quarter-wave plate.

15. Claims 46-48 has limitations similar to those treated in the above rejection(s), and are met by the references as discussed above. In addition, Leube also teaches the following limitations:

(a) as in claim 46, an analyzing unit 20 that detects a polarization angle of reproducing light transmitted by the optical element (Fig. 1);

(b) as in claim 47, rotating the optical recording medium (Fig. 1; inherent feature because the recording medium needed to be rotate in order to access the recorded information);

(c) as in claim 47, radiating the reproducing light along a diameter direction of the optical recording medium (Fig. 1; inherent feature because the reproducing light needed to be radiated along the diameter direction of the medium in order to access the recorded information); and

(d) as in claim 48, the optical recording medium 12 (Fig. 1).

16. Method claims 49-51 are drawn to the method of using the corresponding apparatus claimed in claim 1. Therefore method claim 49 corresponds to apparatus claim 1 and are rejected for the same reasons of anticipation (obviousness) as used above.

In addition, Leube teaches the following:

(a) as in claim 50, an analyzing unit 20 that detects a polarization angle of reproducing light transmitted by the optical element (Fig. 1); and

(b) as in claim 51, an optical recording medium.

Furthermore, Lindow teaches the following:

(a) as in claim 50, a medium driving mechanism that rotates the optical recording medium 34 (Fig. 1; medium driving mechanism is an inherent feature because the recording medium needs to be rotated); and

(b) as in claim 50, a head moving mechanism that moves an optical head that includes the light source, the spatial optical modulator and the focusing optical system 30 (Fig. 1; inherent feature of Leube's optical head which houses above claimed light source, modulator and focusing element).

Claim 50 however also recites the following limitations:

(a) the optical recording medium acts as a quarter-wave plate.

Michl teaches that the media having the property of birefringence can be either acts as a quarter-wave or a half-

wave plate (Fig. 7; column 13, lines 37-41; column 14, lines 49-54). Therefore, as an alternative choice of design, it would have been obvious to one of ordinary skill in the art at the time of invention to change the birefringence of Leube's recording layer as a quarter-wave plate.

17. Claim 52 has limitations similar to those treated in the above rejection(s), and are met by the references as discussed above. In addition, Lindow also teaches the following limitations:

(a) as in claim 52, a focusing optical element 30 that irradiates an optical recording medium 34 with reproducing light (Fig. 1; and

(b) as in claim 52, an analyzing unit 44 that detects a polarization angle of reproducing light acted on by the optical recording medium (Fig. 1).

18. Method claim 53 is drawn to the method of using the corresponding apparatus claimed in claim 1. Therefore method claim 53 corresponds to apparatus claim 1 and are rejected for the same reasons of anticipation (obviousness) as used above.

In addition, Leube teaches the following:

(a) as in claim 53, forming an optical element on the optical recording medium by the illumination having an azimuth

corresponding to a polarization angle on the optical recording medium (Fig. 1; optical elements which induces birefringence is formed in the recording layer);

19. Claim 54 and 55 has limitations similar to those treated in the above rejection(s), and are met by the references as discussed above.

In addition, Leube teaches the following:

(a) as in claim 54 forming an optical element on the optical recording medium by the illumination having an azimuth corresponding to a polarization angle on the optical recording medium (Fig. 1; optical elements which induces birefringence is formed in the recording layer);

(b) as in claim 55, the optical element acts on reproducing light to adjust a polarization angle of the reproducing light (Fig. 1; the reflected/reproducing light is rotated by induced birefringence);

(c) as in claim 55, adjust a polarization angle of the reproducing light by an amount greater than a difference between a polarization angle of the recording light and a reproducing light (Fig. 1; inherent feature because the reflected light is being rotated furthermore by the induced birefringence) and

(d) as in claims 53 and 54, determining a polarization

angle of reproducing light acted on by the optical element (Fig. 1; detector 20 detects polarization angle).

Conclusion

20. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ohtake et al. (5,447,778) is pertinent because Ohtake teaches a monomolecular film in an organic recording layer.

Eich et al. (5,024,784) is pertinent because Eich teaches an optical data storage using polymeric liquid crystals.

21. Any response to this action should be mailed to:

Commissioner of Patents and Trademarks Washington, D.C. 20231 Or faxed to:

(703) 872-9314 (for formal communications intended for entry. Or:

(703) 746-6909, (for informal or draft communications, please label "PROPOSED" or "DRAFT")

Hand-delivered responses should be brought to Crystal Park II, 2021 Crystal Drive, Arlington. VA., Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-4700.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kim CHU whose telephone number is (703) 305-3032 between 9:30 am to 6:00 pm, Monday to Friday.

KC 7/8/02

Kim-Kwok CHU
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